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Analysis of archaeal communities in Gulf of Mexico dead zone sediments.

Sediments may contribute significantly to Louisiana continental shelf "dead zone" hypoxia but limited information hinders comparison of sediment biogeochemistry between norm-oxic and hypoxic seasons. Dead zone sediment cores collected during hypoxia (September 2006) had higher levels of NH_4^+, Fe_2^+ and dissolved inorganic carbon in porewater, and reduced solid iron, than cores collected in norm-oxic conditions (April 2006). These results suggest reduced end products of microbial respiration accumulated as oxygen diminished in the overlying water. In sediments, different microorganisms compete for the same electron donors and acceptors and against abiotic reactions. Analyses of microbial communities might help to differentiate processes taking place in the sediments. *Archaea* have been shown to dominate ammonium-oxidizer communities in marine systems. Therefore, pyrosequencing of 16S rRNA genes using *Archaea*-specific primers was undertaken to investigate archaeal community composition in the April and September 2006 sediment cores. *Crenarchaeote* sequences accounted for over half of the 260,000 sequences obtained. The most abundant cluster of genus-level (97% similarity) sequences contained that of an uncultured, *Desulfurococcaceae*-related archaeon. Sequences within the cluster accounted for 11% of all those obtained. They were most abundant in the deepest sediment core fractions (6 to 10 cm) collected during hypoxic conditions in September. The next three most abundant clusters included the ammonium-oxidizing archeaon, *Nitrosopumilus* and accounted for 15% of the total sequences. *Nitrosopumilus* clusters were most abundant in the upper 6 cm of sediment and were significantly higher in cores collected under norm-oxic conditions. These results reveal changes in the community structure of *Archaea* in the upper sediments, including abundance of *Nitrosopumilus* spp., which may be associated with the availability of oxygen needed for ammonium oxidation.